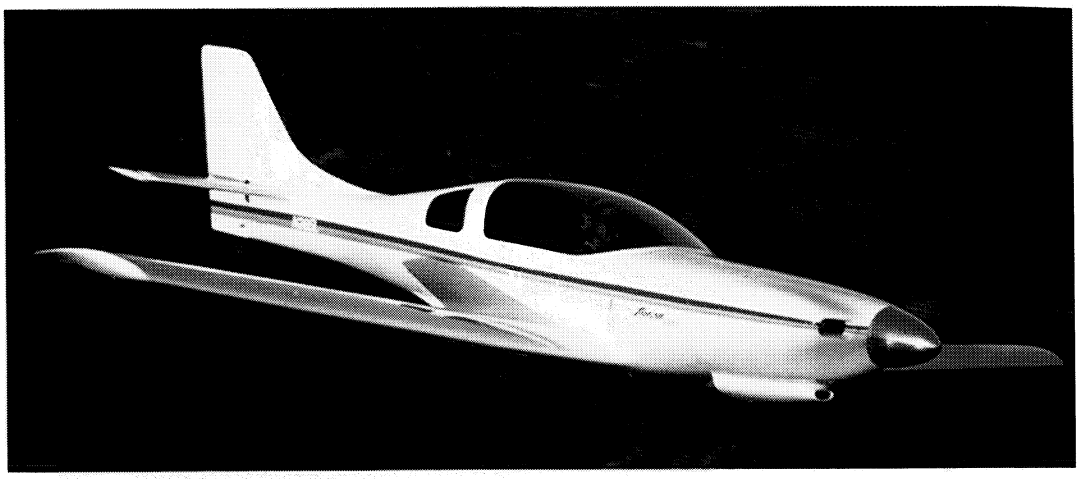
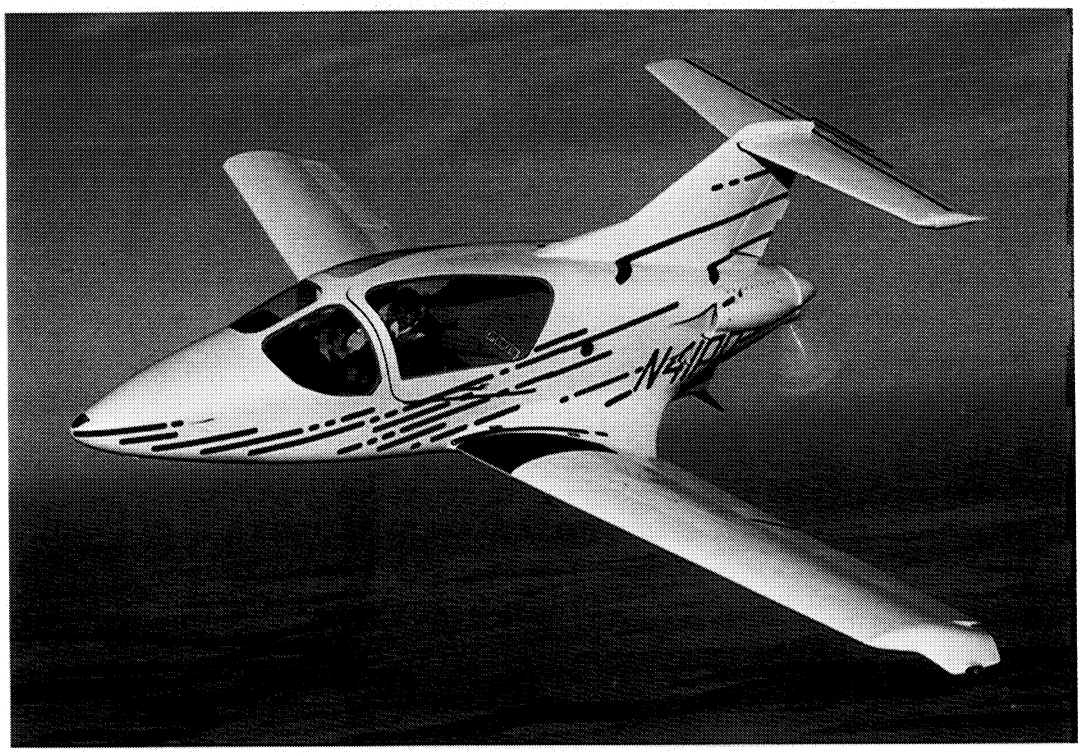
Advanced Lightplane Wing





At upper right is the Lancair, a recently-introduced two-place private airplane of the "homebuilt" variety, one assembled by the owner from a parts/components kit supplied by a manufacturer. At lower right is another homebuilt, the four-place Prescott Pusher. In addition to the fact that both are kit planes, they share another common feature: each has a NASA-developed high efficiency natural laminar flow (NFL) wing.

Lancair airframe kits are manufactured by Neico Aviation, Santa Paula, California; the airframe is designed to accommodate any of three basic engines in the 100-125 horsepower range. Capable of cruising at more than 200 miles per hour, the Lancair is built of premolded parts made of advanced composite materials. The airplane has a gross weight of only 1,400 pounds.

Prescott Pusher airframe kits are produced by Prescott Aeronautical Corporation, Wichita, Kansas. The company employed Computer-aided Design (CAD) techniques to assure extreme accuracy in shaping the configuration; at right, a design engineer is studying the NASA NLF airfoil on a CAD terminal. Prescott also employs Computer-aided Manufacturing (CAM) techniques to build the hard tooling that produces the kit parts to extremely precise tolerances.

The tubular fuselage frame of the Prescott Pusher is heliarc welded at the factory and wings, tail and control surfaces are of traditional aluminum. At top right a Prescott employee is

"clecoing" a wing—joining wing parts with temporary cleco fasteners, which are removed after the wing is riveted. A rear-mounted 180-horsepower engine with a four-bladed pusher propeller allows speeds up to 200 miles per hour; an advanced rotary engine and other powerplants being tested are expected to boost cruise speed above 200 miles per hour.

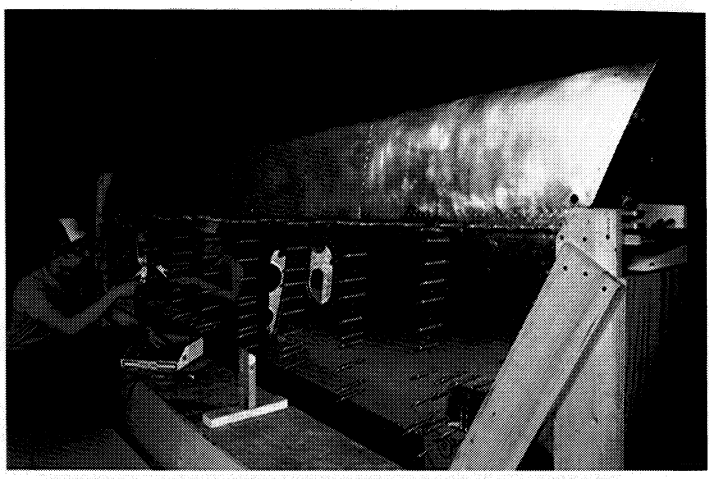
Both airplanes were in the conceptual stage in the early 1980s when NASA's Langley Research Center was developing the NLF airfoil. "In fact," says Neico Aviation president Lance A. Neibauer, "it was really the airfoil which provided the final stimulation to charge ahead with the Lancair project."

Prescott Aeronautical had this comment on the wing design:

"NASA's June 1983 release of the natural laminar flow airfoil fit right into the plans of Tom Prescott, who was designing an affordable high performance general aviation aircraft. The new (wing) section was designed by Dan Somers, a research aerodynamicist at Langley Research Center. Somers's objective was to develop a wing that would offer outstanding lift-to-drag ratio with a minimal amount of pitching moment. He succeeded."

Langley has long been active in developing technology for general aviation, meaning all planes other than commercial airliners and military aircraft. Langley's work focuses on improved safety and greater airplane efficiency through development of new wings, auxiliary airfoils and other components. In the 1970s, Langley developed a GAW series of general aviation airfoils with high lift characteristics and better safety through benign stalling qualities. At about the same time, Langley was also working on natural laminar flow airfoils, principally for military aircraft. As a follow-on to the GAW series, Langley began work in the latter 1970s on an advanced technology NLF airfoil for general aviation aircraft.

Laminar means "smooth." The intent of the NLF design is to overcome the tendency of the air flowing over the wing to become turbulent as airplane speed increases. Maintaining smooth airflow in cruise flight reduces air drag and that translates into reduced fuel consumption or greater speed, possibly both. The Langley-designed NLF airfoil can reduce induced drag by as much as 30 percent while also providing improved lift. In addition, it is more tolerant of airflow disturbances than earlier laminar flow airfoil. Says Neico Aviation: "Losing tremendous amounts of lift when laminar flow is lost does not occur with this new NLF series. If laminar flow is lost—due to rain or bugs, etc. on the leading edge of the wing—induced drag will increase somewhat but lift will remain essentially the same and flight characteristics of the plane will not change noticeably."



The first Lancair prototype flew in 1984 and in 1985 the airplane was a best seller among general aviation aircraft. The Prescott Pusher was first flown in 1985 and kit sales began in 1986. A "frozen-design" Prototype II, shown being assembled above, is in test status. ▲